Identification and Exclusion of Aquaculture Origin Salmon from Maine Rivers

Maine Atlantic Salmon Commission

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ASC Policy on Aquaculture-suspect Atlantic Salmon

- Suspected aquaculture salmon captured in traps are removed from the river
- Fish are sacrificed, measured, photographed, and sampled (disease, scales, and genetics)
- Salmon are offered to local Tribes if fit for human consumption

Why exclude aquaculture salmon?

- Genetic Interactions (interbreeding reduces fitness of wild salmon)
- Disease Risks
- Competitive Interactions (adults)
- Competitive Interactions (juveniles)
- Adults may prey upon juveniles

Maine Rivers with Salmon Traps

- **Dennys**
- **Pleasant**
- **Narraguagus**
- **East Machias (200???)**
- **Penobscot**
- **St. Croix**
- **Saco**
- **Androscoggin**
- **Aroostook**

Dennys Weir

Aquaculture and Wild returns Narraguagus River

Year	Aquaculture	Wild	
1994	1	51	
1995	0	56	
1996	8	64	
1997	0	37	
1998	1	22	
1999	3	32	
2000	0	23	
2001	0	32	
2002	0	8	
2003	0	12	

Aquaculture and Wild returns Dennys River

Year	Aquaculture	Wild	
1994	42	6*	
1995	4	5*	
1996	21	10*	
1997	2	0*	
1998	1	0*	
1999	0	0*	
2000	28	1	
2001	62	17	
2002	4	2	
2003	1	6	

Case: Dennys River, 2000

- Captured 28 salmon identified as aquaculture origin
- 1 wild fish released upstream from weir
- 1 suspected aquaculture fish was released alive downstream, but later scale analysis revealed it was a Dennys strain fish released as a smolt

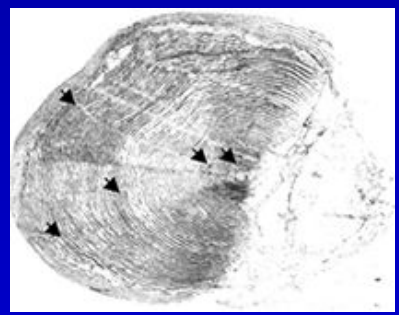
The Challenge

- **Allow** upstream passage for wild and agency-stocked hatchery fish
- **Deny** upstream passage of aquaculture origin salmon

Correct	Wrong
Pass WILD salmon	Deny WILD salmon
Deny AQUACULTURE salmon	Pass AQUACULTURE salmon

Characters Used for Differentiation

- Fin condition
- Body form and condition
- Scale patterns



Fin Condition

- Deformed fins are common in captive reared salmon
- The longer a salmon is reared in captivity, the greater the extent of fin deformities

Dorsal Fin Condition

Wild

Captive reared

Pectoral Fin Condition

Wild

Captive reared

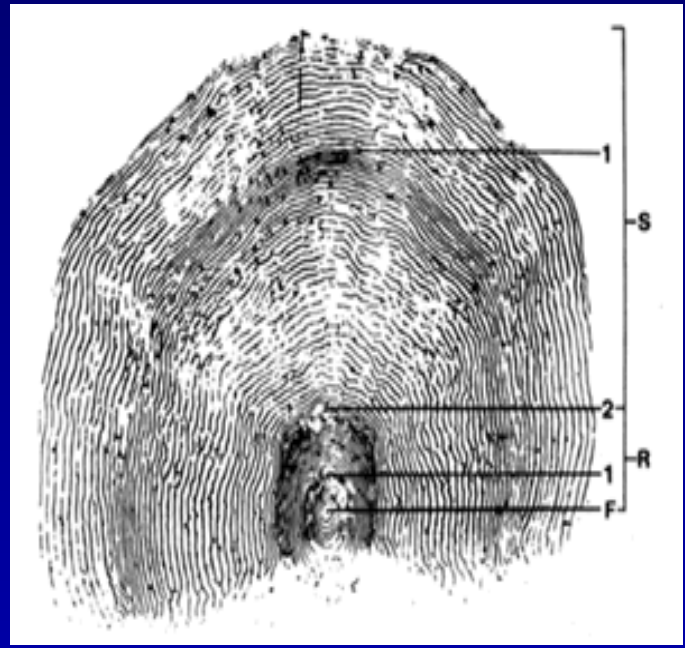
Caudal Fin Condition

Wild

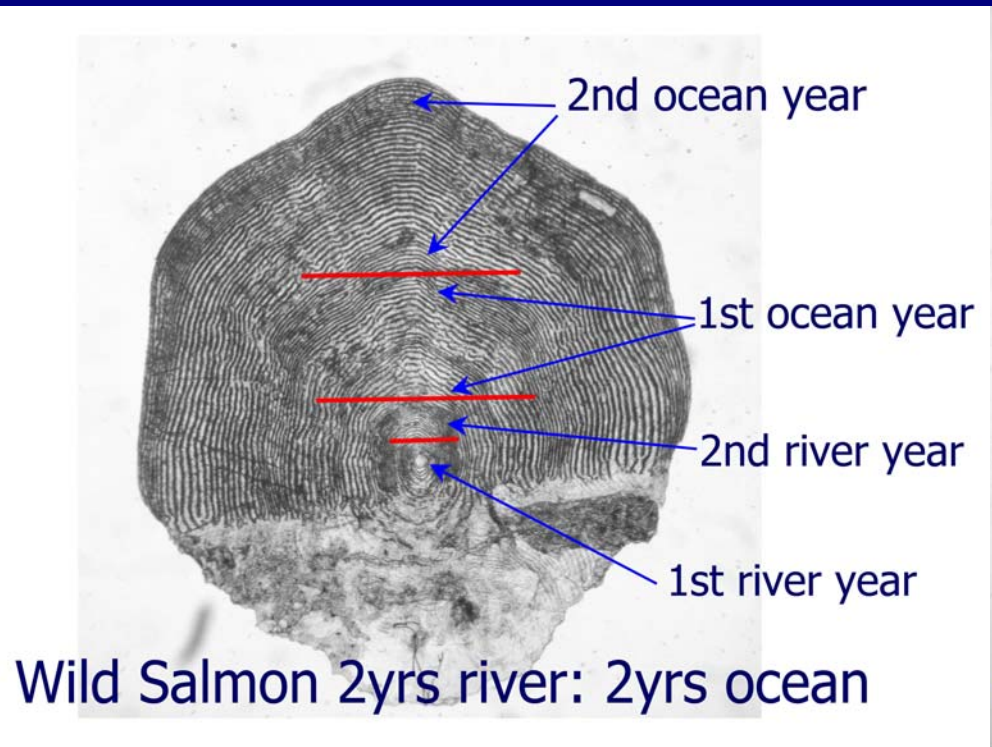
Captive reared

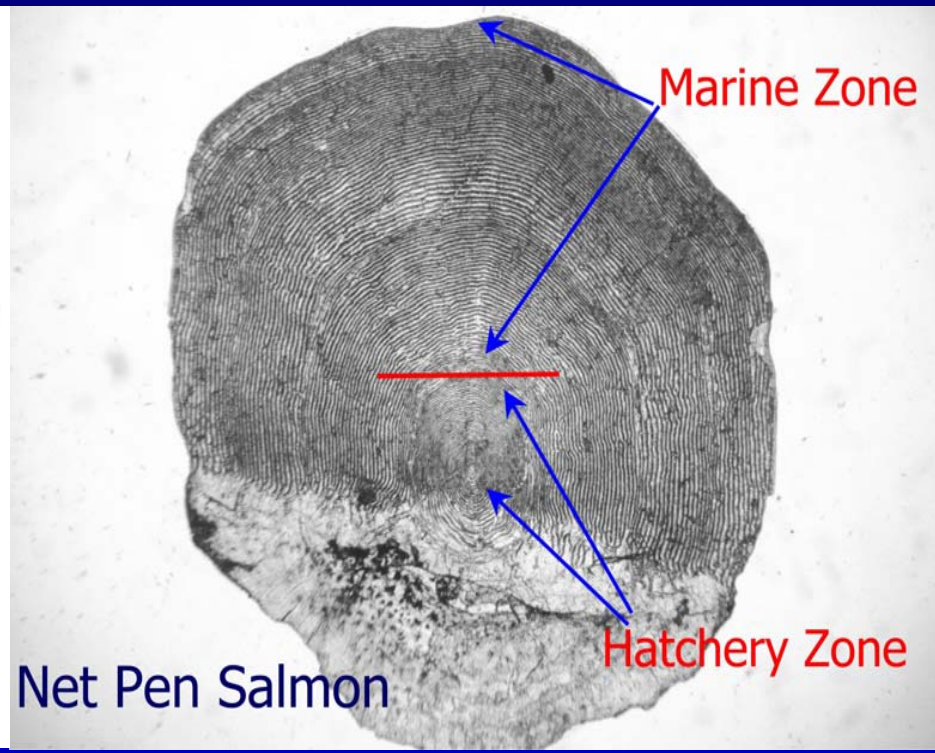
Scale Patterns

- Most wild smolts - 2 or 3 years old
- Most hatchery smolts - 1 year old
- Stocked smolts are often finclipped and tagged
- Wild fish show more seasonal variation in scale banding



Scale Patterns





Scale Reading Assessment

- State, Federal, and Industry staff are assessing the accuracy of scale reading and how training improves accuracy of identification

Comparison: Wild and Aquaculture

Suspected Aquaculture Salmon from Maine rivers

Suspected Aquaculture Salmon from Maine rivers

Identification is not perfect…

- Relies on multiple characters
- Field interpretation of scales is tricky
- High quality aquaculture fish obscure external differences from wild salmon
- Differentiation between a restoration adult stocked as a smolt and an aquaculture fish can be challenging

More Challenges

- Aquaculture fish that escape when small may look like restoration salmon stocked as smolts
- Managers stock fish at a variety of life-history stages, (fry, parr, smolts, and adults)

What about DNA testing ?

- IF… European lineage, DNA testing will usually correctly identify as aquaculture
- IF… Penobscot/St. John lineage, DNA testing may not give definitive ID
- DNA sampling is not practical for field ID, because of time involved

How do we fix this?

- Weir staff training minimizes ID errors, but field ID remains a challenge
- Reduction in escapees minimizes risk at weir traps
- An external mark for aquaculture salmon makes field ID easier and more accurate

Containment *and* Exclusion

- Minimizing escapes from net pens and hatcheries limits entry into Maine rivers
- Fewer aquaculture fish in traps and high ID accuracy minimizes interactions
- Keep numbers of escapees small relative to wild salmon and threats are reduced

Legislative Challenges

- Permitting for aquaculture sites occurs at State and Federal levels
- Permits for barrier weirs are at the mercy of local government

- East Machias barrier weir has been in regulatory "limbo" for 2+ years, with no barrier in place, and an uncertain future